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**ИННОВАЦИОННЫЙ ПОТЕНЦИАЛ КАК ФАКТОР
УСТОЙЧИВОГО РАЗВИТИЯ РЕГИОНА**

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Аннотация

Инновации и научно-технические разработки становятся неотъемлемыми составляющими устойчивого экономического роста не только государств, но и отдельных их регионов, в особенности обладающих значительными интеллектуальными и промышленными ресурсами. Республика Беларусь имеет значительный научно-технический и производственный потенциал, поэтому быстрое развитие науки, инновационной деятельности приобретает стратегическое значение. Этим обусловлен выбор инновационного развития экономики. В этой связи особое значение приобретает комплексный анализ инновационного состояния областей Республики Беларусь с помощью предложенного методического инструментария оценки инновационного потенциала. Анализ позволяет определить тенденции научно-технологического развития, оценить и выявить скрытые возможности регионов, их способности к усовершенствованию и обновлению, а, следовательно, применять эффективные управленческие решения, формирующие стратегию устойчивого развития регионов, на основе выделенных факторов конкурентоспособности.

Ключевые слова: инновационный потенциал, регионы, индикаторы инновационного потенциала, кластер, совокупный инновационный продукт.

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**INNOVATIVE POTENTIAL AS A FACTOR OF SUSTAINABLE
DEVELOPMENT OF THE REGION**

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Abstract

Innovations, scientific and technical developments are becoming the integral components of sustainable economic growth not only for countries, but also for individual regions, especially those with significant intellectual and industrial resources. The Republic of Belarus has a significant scientific, technical and production potential, so the rapid development of science and innovation is of strategic importance. This is the reason for choosing the innovative development of the economy. In this connection, a comprehensive analysis of the innovative state of the regions of the Republic of Belarus takes on special significance with the help of the proposed methodological tool for assessing innovation potential. The analysis makes it possible to identify some trends in scientific and technological development, to assess and identify the hidden potentials of the regions, their ability to improve and update, and, consequently, to apply effective management solutions that formulate a strategy for sustainable development of regions, based on the identified factors of competitiveness.

Keywords: innovation potential; regions, indicators of innovative capacity; cluster; total innovative product.

A characteristic feature of the world community development at the present stage is the forming of the socio-economic system where the innovative activity

plays a dominant role, as a factor that provides a competitive advantage of a higher order. In general, an innovative economy construction and its control

system involve in a fundamental restructuring of the directions of development, new approaches to the justification of the priorities, significant modernization of methods and forms of use of resources at all levels of the innovation system. In this context, one of the important areas of formation of the innovative economy is its regional dimension.

Currently, there are many interpretations of the concept «potential». Most of the papers highlight the importance of studies assessing the potential problems and indicate significant differences in the definition of its nature, structure and relations with other categories. In broad terms, the potential is «the totality of the available funds, opportunities in any field». The essence of the concept of «innovation potential» is to define its main resource interconnected components, as well as indicators of the level [1, с. 254]. In this regard, the concept «innovation potential of the region» can be viewed as a set of scientific, human, technical, financial and economic capacities and information and communication component, providing innovation, and determining the competitiveness of the regional economy. To innovate, regions should have sufficient innovative potential. Therefore, the choice of methodology for assessing the innovative potential of the region is extremely important.

In the modern world practice, there is a large number of indicators that assess the level of development of innovative potential and innovative activity. International organizations develop a different system of indicators for their own purposes, which are widely used along with the consolidated indicators showing the level of innovative potential of a country or region.

This is the index of scientific and technical potential [5] whose calculation is based on the following data: the number of patents per 1 million population, the country's position in terms of technological development, the contribution of foreign investment in innovative activities of local firms; Internet users per 10,000 people, and so on; the system of indicators to measure innovation (European Innovation Scoreboard, EIS) of the Commission of the European Communities; now the system has been around from 5 categories of indicators, including 26 key indicators of innovation activity: implementation factors of innovation, the creation of innovation, innovation in business, application, and the role of innovation in the creation of added value, intellectual property; published annually by the OECD indicators characterizing the level and dynamics of the innovation economy of developed and selected developing countries.

These include: the share of high-tech sector in manufactured goods and services, innovative activity, the volume of investments in the knowledge sector (public and private), including the costs of higher education, research and development, as well as investment in software development, design and production of communications equipment, software and services, the number of those engaged in science, etc.

The above system of indicators was established by developed countries, as they are aimed at assessing sufficiently the high innovation potential of these countries and, but this system does not take into account a number of factors specific to emerging economies (such as the level of development of innovative legislation).

The most famous methods to measure innovation potential used abroad is the sub-index innovation potential of the Global Competitiveness Index (GCI), calculated for the Global Competitiveness Report [6] and the Global Innovation Index (GII), calculated by the Institute of Business Administration INSEAD [7]. Innovative potential at the regional level is directly measured in developed countries by administrative authorities, such as the European Commission or the administration on economic development in Maine, Mississippi and Oregon in the United States. The European regional innovation scoreboard is popular and well known [8]. But all of these indicators have been developed for ongoing monitoring of innovative activity, highlight the strengths and weaknesses of the regions. They use a limited number of indicators available in international statistics and subjective expert assessments.

The known methods to assess the level of scientific and technological potential of the region also include:

- the method of integral evaluation of scientific and technical potential of the country (Japan), based on a comparative assessment of the absolute performance of individual countries (or regions, depending on the objectives of the study), characterizing the resource potential and the results of scientific and technical potential [9];
- a comprehensive assessment of the scientific method – the technical capacity of the country (the US), involves the calculation of such integrated indicators, as a national orientation, socioeconomic infrastructure, technological structure, productivity, based on expert assessments included in these indicators;
- the method of calculating the index of knowledge (World Bank), which is an average of three constituent indices: the innovation system, the index of education and human development, the index information infrastructure;

- the method of calculating the total innovation index (Netherlands), which the authors believe that the innovative potential of the region does not include persons with academic degrees and titles, and the population with higher education, as well as people participating in continuing education [10];

- the methods of structural analysis of innovative activity area, based on the calculation of three indices: knowledge-based industries, technological independence, technological exchange;

- the method of regression analysis of innovative activity area, allowing to identify the factors and their impact on the level of innovation activity area;

- the method of factor analysis, the innovation potential of the region, based on the assessment of elements of innovative potential of the region as a research potential of the population, input intensities of the gross regional product (GRP) for research; «High» GRP Ph.D., «High» GRP researchers with academic degrees, inventive potential of the economically active population, level of innovation activity of organizations;

- the method of clustering regions, based on the calculation of the six indicators of development of the innovation system of the region: the ratio of wage levels in the sector «Science and Scientific Services» and in the regional economy as a whole; the ratio of domestic expenditure on research and development and GRP; the share of exports to foreign countries in SSA; the proportion of personnel engaged in research and development in the total employment in the economy; the number of issued patents and certificates per 1 million people population; GRP per capita level [11].

Despite the significant advantages, the listed methods are characterized by the following negative qualities:

- complex and uncertain calculations, high input intensities in most output indicators;

- failure, inaccuracy, lack of access to the source of information is often the basis for calculating the indicators;

- disparate elements of innovation capacity;

- lack of a clear system of indicators to make a clear presentation of the level of innovative potential of the region;

- fragmentation techniques, lack of a unified methodology for assessing the innovative potential of any economic system.

Calculations of innovative potential made for these techniques show that no country can demonstrate the balanced development of all the key factors of competitiveness. On the one hand, it reflects the presence of problem areas and reserves increased efficiency, on the other – shows that by improving one or two parameters of innovative development, you can get ahead in the world of competition.

According to the analysis of the methods to measure innovation capacity at the regional level, we can formulate the following methodological principles to the assessment of the innovative capacity at the regional level.

1. Structural innovation potential can be considered both in terms of resource components characterizing the ability of individual resources for the implementation of innovative activity in the region; and efficient components, reflecting the results of the implementation of the use of resource capabilities, that is characterizing the achieved level of innovation capacity.

2. Accordingl, to assess the current state of the innovation potential requires a set of indicators that reflect its resource and efficient components. This will determine the ability of the region to implement the innovation.

3. To determine the level of sufficient capacity, a normative model should be developed that characterizes the boundary parameters of its satisfactory and unsatisfactory states.

4. Comparison of current and normative parameters allows you to emphasize the strengths and weaknesses of the innovation processes. It eventually serves as the basis for the development of activities aimed at maintaining positive and overcome the negative trends of innovative development.

Thus, the algorithm for estimating the innovative capacity at the regional level can be represented in the form of three successively (Table 1).

Table 1

Algorithm evaluation of innovative potential of the region

Stage	Aims of the stage
I. Description of the regulatory state model of innovation potential through the quantitative and (or) quality requirements and resource efficient characteristics of potential	Definition of the list of indicators and their border characteristics used to estimate the innovation potential of the region
II. Assessment of the actual (current) state of the innovation potential (subject developed a normative model)	Analysis of the error and the actual parameters of regulatory capacity – allocation of its strengths and weaknesses
III. Characteristics of possible directions to strengthen the innovation potential of the region (based on the results of the analysis)	Formation of the innovative profile of the region, its zoning. Defining areas of implementation of innovation

Currently, there is a sufficient number of developments in the study of the state of the innovation potential of the regions. It's connected with the emergent and aggravated problem over the years of reforms of social and economic security. However, the questions of justification of border states of innovation development sanctified very little – mostly they are reduced to the evaluation of

the scientific and technological sector, while the innovative component of the economy should be considered more widely. In this paper, the characteristics of aggregated estimates are developed and presented in the publications of the scientists of the Russian Academy of Sciences (Table 2) [2; 3, p. 112-132].

Table 2

The system of general indicators characterizing innovation potential of the region

A group of characteristics	Characteristics	Relative symbol of characteristic	Boundary Characteristic of the symbol	
			R	Z
Regular component	Share of employees with higher education in the total number of industrial production personnel. rel. u	K1	0.25	0.8
	The share of expenses for professional training in total labor costs. rel. u	K2	0.15	0.5
	University graduates 10 000 of population. employed in the economy. people.	K3	100	150
Technical-technological component	The level of depreciation of fixed assets. in%	T1	60	25
	The coefficient update fixed assets.%	T2	4.5	12.0
	The share of equipment operation life up to 10 years. rel. u	T3	0.33	0.7
Financial component	The share of expenditure on science and research and development in gross regional product (GRP). in%	F1	2.5	5
	The share of expenditure on innovation in the total volume of production. %	F2	2.5	5
	The ratio of the volume of investment in fixed assets to GRP. %	F3	2.4	11.8
Scientific component	The specific number of employees engaged in scientific research. for 1 thousand. People. population. persons.	H1	13	40
	The number of PhDs per 100 people. population of the territory. people.	H2	0.4	4.0
	The share of the cost of machinery and equipment in total assets branch «Science and scientific services». %	H3	16	35
Efficient component	The number of patent applications for inventions based on the 10 000 of population. %	P1	2.5	5
	Level of innovative activity of industrial enterprises.%	P2	40	10
	Share of innovation products in the total volume of production of industry.%	P3	8	15

Table 3

The regulatory assessment model of innovation potential of the region

View of anequality	Characteristic of the innovative capacity Condition
$I \leq R$	Poor condition requiring radical transformations – classified as a weakness of innovation potential
$R < I < Z$	The state of crisis that requires limited changes to achieve the goals of innovation development
$I \geq Z$	Satisfactory condition. adequacy of tactical innovation goals – requires changes aimed at maintaining positive momentum. and is classified as a strong point of the innovation potential

where:

I – the value of summary measure characterizing the resource and effective component of the innovation potential;

R – threshold summary measure of innovative capacity. expressed in terms of characteristic parameters reflecting boundary minimum level of crisis of his condition;

Z – threshold summary measure of innovative capacity. expressed in terms of characteristic parameters reflecting its pre-crisis state border.

This method has been tested on the material regions of the Republic of Belarus. The study period covers 2010 and 2015. (Table 4). Market reforms

require appropriate changes in the monitoring and collection of reliable data. So far. due to lack of direct reporting on some items. adjustments are made

using indirect data and reviews of various government organizations. The task of searching statistical data on the subjects of the republic seems even more difficult than for the country as a whole. Regional statistics are much poorer than the national. The most holistic information about the economic performance of the region is aggregated in Brest region, and it has formed the basis of this study [4].

Table 4

Initial and calculated data for the evaluation of innovative potential of the regions of the Republic of Belarus
Personnel component

Share of employees with higher education in the total number of industrial production personnel. rel. u

Region	Years	
	2010	2015
Brest region	0.22	0.24
Vitebsk region	0.21	0.23
Gomel region	0.21	0.24
Grodno region	0.23	0.24
Minsk	0.37	0.4
Minsk region	0.19	0.22
Mogilev region	0.21	0.24

University per 10000 population employed in the economy

Region	Years	
	2010	2015
Brest region	100	109
Vitebsk region	109	148
Gomel region	146	164
Grodno region	87	121
Minsk	369	406
Mogilev region	148	155

Technical-technological component

The level of depreciation of fixed assets, %

Region	Years	
	2010	2015
Brest region	45.8	40.5
Vitebsk region	50.7	47.3
Gomel region	46.4	42.4
Grodno region	46.1	40.7
Minsk	46.9	40.6
Minsk region	47.8	41.2
Mogilev region	47.1	38.8

The coefficient update fixed assets, %

Region	Years	
	2010	2015
Brest region	9.3	6.5
Vitebsk region	6.1	5.2
Gomel region	6.8	6.8
Grodno region	8.4	9
Minsk	8.5	7.9
Minsk region	9.1	9.4
Mogilev region	8.2	8.5

The financial component

Domestic expenditure on research and development as a percentage of the GRP, %

Region	Years	
	2010	2015
Brest region	0.09	0.07
Vitebsk region	0.17	0.18
Gomel region	0.53	0.88
Grodno region	0.13	0.12
Minsk	2.12	2.03
Minsk region	0.30	0.22
Mogilev region	0.17	0.16

The ratio of the volume of investment in fixed assets to GRP, %

Region	Years	
	2010	2015
Brest region	4.9	3.8
Vitebsk region	3.6	3.9
Gomel region	4.4	4.5
Grodno region	4.4	4.5
Minsk	2.8	3.1
Minsk region	4.4	4.6
Mogilev region	4.3	3.6

Scientific component

The specific number of employees engaged in scientific research, per 1000 population

Region	Years	
	2010	2015
Brest region	0.58	0.56
Vitebsk region	1.06	0.81
Gomel region	2.9	2.4
Grodno region	0.57	0.44
Minsk	24	21.1
Minsk region	2.7	3
Mogilev region	0.56	0.6

The number of PhDs per 100, population

Region	Years	
	2010	2015
Brest region	0.29	0.19
Vitebsk region	0.55	0.53
Gomel region	1.56	1.43
Grodno region	0.6	0.42
Minsk	32.7	30.1
Minsk region	3.17	3.5
Mogilev region	0.38	0.32

Efficient component

Level of the innovative activity of industrial enterprises, %

Region	Years	
	2010	2015
Brest region	15.0	15.3
Vitebsk region	8.2	30.3
Gomel region	11.0	19.7
Grodno region	14.9	19.7
Minsk	14.5	32.3
Minsk region	10.2	18.1
Mogilev region	9.9	17.1

Share of innovation products in the total volume of production of industry, %

Region	Years	
	2010	2015
Brest region	4.4	4
Vitebsk region	16.6	31.2
Gomel region	8.9	21.2
Grodno region	9.4	6.9
Minsk	12.2	25
Minsk region	9.3	9.9
Mogilev region	13.2	14.6

Thus, our calculations based on the available statistical indicators presented in table allow us to identify and rank the most difficult problem factors on innovation development:

1. In general, innovation in the region changes has been positive. This applies both to its resource component and productive characteristics. However, their level is generally in the area of crisis and even poor condition. That is the innovative potential and as the ability and readiness can be described as insufficient for the formation of innovation activity of the region's economy.

2. Among the most problematic resource characteristics are human, financial and scientific units by region of the country, except Minsk. Despite the fact that in recent years there has been a steady growth in the share of investment in fixed capital of the regions, their scientific and innovative component is at a very low level. The scientific sphere is also characterized by negative trends in the sphere of its personnel and logistics.

3. A more satisfactory situation is in the technical, technological and human resources areas. There is a gradual improvement in these indicators. In particular, there has been a slight decrease in the level of depreciation of fixed assets (T1), increased rate of updates (T2). The indicator on the material base for the production of competitive and innovative products – the share of equipment operation life up to 10 years (T3) – is absent in the regional statistics, but the overall figure for the country shows its significant reduction in the rate is unsatisfactory. In the personnel area, it is a gradual increase in the educational level of workers is noticeable due to the positive dynamics of the indicators characterizing the training and retraining of staff of enterprises (K3). Indicator K2 in regional statistics is absent, but the Republic of Belarus demonstrates dynamics of increasing the cost of vocational training of the workforce.

4. Uneven regional development is one of the basic realities in developing countries. We need to develop a balanced regional development model that takes into account the specificity of each area and is of innovative socially oriented nature. There is a

correlation between central and peripheral areas. The development of the periphery through the development of the center depends on it. There is initial unevenness in the development, though the resources are originally extracted from the periphery. Elimination of unevenness can be reached by supporting entrepreneurship in peripheral areas, and the creation of favorable innovation environment.

5. Much more positive is the situation regarding the performance of innovative consumption (P2, P3), which is characterized by a gradual approach to the exit from the zone of crisis. However, their interest is different from relative thresholds in the regions of Belarus. It reveals the negative side of innovation processes in the regions – increasing the share of innovative products at the expense of the small number of businesses with resource capabilities to implement them. This is clearly evidenced by the statistics on sectoral differentiation indicators of innovation activity. The leaders here are the food industry and the engineering industry.

The level of patent activity of the population is still unsatisfactory, which is far behind the national average in the world. Patenting of inventions and discoveries as a way of registering intellectual property fully reflects the processes of development of the scientific sphere. This allows using the patent information and analyzing the intensity of innovation, and identify the features of its territorial differentiation. Thus, the assessment of this indicator in the country indicates that our regions are not among the centers of patent activity, mainly the implementation of innovations is done at the expense of technology exports from other countries. The situation is largely caused by the weakening of the activity during the years of reforms, as design bureaus of industrial enterprises have almost disappeared, besides there can be noted a lack of regional specialized research institutes, as well as the underdevelopment of the innovation infrastructure.

To summarize the above, it can be noted that the strengthening of innovation in the regions is seen in addressing three interrelated tasks:

- to activate the resource capabilities of the innovative capacity (first and foremost financial component, in fact, defining all the other components);

- to increase the productivity indicators of innovative development, including the reduction of significant differences in the spatial development of innovation (both in industry and in the territorial contexts);

- to encourage the spread of new technologies through the cluster approach in the implementation of innovation policy, which currently is one of perspective at the regional level.

All this requires a change in management of innovation processes in accordance with the following requirements:

1) taking into account the uncertainty, high risk and high cost of innovation;

2) insuring coordination of innovation policy (at all levels) with economic, social and environmental aspects of territorial development;

3) to achieve a balance of interests and the optimal combination of objects and subjects of innovative activity in order to ensure effective results of socio-economic development;

4) the transformation of nature management in the conditions of formation of innovative activity of the economy.

The current experience of developed countries shows that effective regional economic development depends on a complex system of interrelated factors, including the geographical location and highly skilled personnel, playing an important but not exclusive role. The most dynamic development is given to the areas with formed innovation clusters as an alternative to traditional sectoral approach. The advantages of the cluster approach include:

- effective implementation of the chain of innovative ideas from its creation to a specific consumer;

- high competitive advantages of enterprises in the cluster due to the internal expertise and capabilities to minimize the costs of innovation;

- presence of industrial clusters of mobile-oriented enterprises in the structure, which encourages innovative point of economic growth in the region;

- creation of a special form of innovation – «aggregate product innovation», which allows taking into account peculiarities of innovative development of each region.

However, clustering is a long and complicated process, with its problems and difficulties. As noted by many researchers, the complexity of the implementation of ideas to create clusters is mainly associated with linking the interests of various parties involved in this process. There are difficulties in the exchange of ideas, knowledge and technology. The problems on the way of clustering can also be attributed to underdevelopment and low innovation activity of enterprises, many of which are characterized by uncompetitive organization of production, high costs and a significant level of depreciation of fixed assets. To assess the capabilities and efficiency of creating regional innovation clusters in Belarus, it is advisable to work on assessing the commercial importance of regional scientific and technological capabilities with the release of the most promising areas that can provide

the greatest commercial effect, taking into account the trends in the world of scientific and technological development.

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